KERN FOOD GROWERS AGAINST SEWAGE SLUDGE

Agricare, Inc. Wm. Bolthouse Farms D.M. Camp & Sons Anton Caratan & Son
M. Caratan, Inc. Dole No. American Deciduous Howard Frick Farm Giumarra Vineyards
Grimmway Farms Jasmine Vineyards Pandol & Sons Sun World, International
V.B.Z. Farms Marko Zaninovich

August 17, 1999

State Water Resources Control Board
Attn: Todd Thompson, Associate Water Resources Control Engineer
Division of Water Quality
P.O. Box 944213
Sacramento, CA. 94244-2130

Dear Mr. Thompson:

The Kern Food Growers Against Sewage Sludge respectfully submit the following comments in response to the **Draft EIR for General Waste Discharge Requirements for Biosolids Land Application:**

As growers of food products in a county that ranks fourth in the nation in agriculture production, we are extremely concerned that any of our farm land is being used to dispose of sewage sludge, much less the disproportionate amount that is being applied in Kern County (one third of state total)[1], as compared to other counties in the state. 26-1

The Water Board's proposed General Order leads us to believe that utilizing farm land for sludge disposal has taken precedence over ground and surface water protection in the state. Our water sources are vulnerable to degradation from many different contaminants commonly found in urban/industrial sewage sludge. In an effort to bring a more reasonable focus on the situation, we present the following facts 26-2

1. California is the most productive agricultural state in the country.
2. Agriculture is the state's number one industry.
3. The most productive agricultural counties in the nation are in California and Kern County is fourth, next to Fresno, Tulare and Monterey counties. 26-3
4. Water is the lifeblood of agriculture in all parts of the state.
5. Yet, there is scientific disagreement (Pages 15-16, DEIR) as to the science used the formulate the 503 regulations and eventual contamination of ground water as a result of application of sewage sludge. There are significant limitations in the scientific community's knowledge of impacts, including the detection and environmental fate of the contaminants found in sewage sludge. A review of currently available scientific literature strongly suggests that land application of sludge presents a very real threat to water supplies. 26-4

[1] Table 2-1 DEIR: Quantities of Land-Applied Biosolids in California by County in 1998

c/o Harper & Shell Associates 1706 Chester Avenue, Suite 553, Bakersfield, Ca. 93301
Telephone: 805/631-9585 FAX: 805/631-9587 e-mail: mkshell@lightspeed.net

5. There is scientific disagreement (Pages 15-16, DEIR) as to the science used the formulate the 503 regulations and eventual contamination of ground water as a result of application of sewage sludge. There are significant limitations in the scientific community's knowledge of impacts, including the detection and environmental fate of the contaminants found in sewage sludge. A review of currently available scientific literature strongly suggests that land application of sludge presents a very real threat to water supplies. 26-5
6. The standards adopted by EPA and the state are much more relaxed for heavy metal content, as compared to many European countries and Canada 26-6
7. Food safety is a priority among all Americans, as well as foreign customers, yet there remains some risk to edible crops when sewage sludge is applied to farm land. 26-7
8. Thousands of Californians depend on agriculture for their livelihood.
9. There is insufficient personnel at the federal, state or regional level to enforce even the most relaxed regulations regarding application of sewage sludge, much less the more stringent set of rules proposed in the DEIR. In fact, the Lahonton Regional Water Quality Control Board can't even meet because of lack of a quorum. 26-8

For these reasons, we ask the State Water Resources Control Board, the keeper of a safe and reliable water supply, take the lead and adopt an EIR that:

1. **Provides equal protection for irrigated farm land as is given to other "unique and valuable public resources" as identified in the GO (Page 10, Draft Text). We propose the state's irrigated farm land be "DESIGNATED A UNIQUE AND VALUABLE PUBLIC RESOURCE," thereby exempting these lands from the GO; or**

2 **We ask a ban on application of biosolids to farm land in California. If the people of the state cannot look to the State Water Board to protect our water supply, then who?** We ask this in the name of future generations of Californians who will depend on an adequate and safe supply of water for human consumption and for growing crops. 26-9

We suggest that other, less harmful (though admittedly more expensive) methods be used to dispose of this material.

If irrigated farm land is not designated a"unique and valuable public resource" or a ban is not adopted as a recommendation, we would ask the **Environmentally Superior Alternative** be recommended-------- the **Modified GO Provisions and Specifications Alternative.** According to the DEIR, this alternative would afford the best available protection for the **soils, ground water, and land productivity** that are our major concerns. Your DEIR also concludes this proposed GO is within a reasonable range of alternatives (Page ES-13)

"We further recommend that the standards for contaminant levels in sludge be set at 75% of the National Sewage Survey mean (Attachment A) and that Beryllium, barium, boron, fluoride and thallium be included. Also, that cumulative loading limits in the soil be limited to the to original Proposed United States 503 limits from 1989." 26-10

We submit a summary of conclusions on projected ground water contamination from sewage sludge in the San Joaquin Valley prepared by noted hydrologist Dr. Kenneth Schmidt (Attachment B). Attached are additional scientific papers in support of our position: 26-11

We should also mention, there are certain mitigation measures identified in the DEIR we strongly support, particularly those that require additional soil and site screening and tracking. However, we strongly suggest that monitoring of ground water be required at defined intervals. A good laboratory practices protocol should be established for the testing of sludge, soil, crops and water. Sampling and analysis should be conducted in a statistically valid manner by an accredited, independent third party. 26-12

Food growers in Kern County produce products valued at nearly $2 billion annually and employ about 50,000 people. The people of our county have a very large stake in the direction you take on this issue. We ask that you seriously consider our recommendations. 26-13

Very truly yours,

Agricare, Inc.	**M. Caratan, Inc.**	**Grimmway Farms**
Wm. Bolthouse Farms	**Dole No. Am. Deciduous**	**Jasmine Vineyards**
D.M. Camp & Sons	**Howard Frick Farm**	**Pandol & Sons**
Anton Caratan & Son	**Giumarra Vineyards**	**Sun World, Intl.**

V.B.Z. Farms **Marko Zaninovich**

encl: Attachments

US EPA CONSERVATIVE?

HEAVY METALS IN SLUDGE

Applications of Heavy Metals to Agricultural Land Through Application of SEWAGE SLUDGE

COUNTRY / Metal	Standards for METALS in Compost and Sludge (PPM) Arsenic As	Cadmium Cd	Chromium Cr	Copper Cu	Lead Pb	Mercury Hg	Mo	Nickel Ni	Selenium Se	Zinc Zn
Netherlands Very Cl Comp. 1995	5.0	0.7	50.0	25.0	65.0	0.2		10.0		75.0
British Columbia (highest PPM of Intl)		10.0	500.0	250.0	500.0			200.0		800.0
National Sewage Sludge Survey (mean)	9.9	6.9	119.0	741.0	134.0	5.2	9.2	42.0	5.2	1,202.0
Wallace Laboratories Standards (UCLA)	50.0	15.0	100.0	150.0	100.0	10.0	30.0	100.0	20.0	1,000.0
United States 503 Clean Sludge	41.0	39.0	1,200.0	1,500.0	300.0	17.0	18.0	420.0	36.0	2,800.0
United States 503 Ceiling Limit	75.0	85.0	3,000.0	4,300.0	840.0	57.0	75.0	420.0	100.0	7,500.0

COUNTRY / Metal Contaminant	YEAR	CUMULATIVE LOADING LIMITS (kg/ha) As	Cd	Cr	Cu	Pb	Hg	Mo	Ni	Se	Zn
Canada	1987	15.00	4.00		150.00	100.00	1.000		36.00		370.00
European Community	1986		6.25		300.00	625.00	3.500		125.00		550.00
Denmark	1984		0.02								
France	1985		3.75	250.00	200.00	125.00	2.300		62.50		550.00
Netherland	1995	0.00	1.25	7.50	7.50	22.50	0.075		3.80		30.00
Average of above countries		na	*3.05*	*128.75*	*164.38*	*218.13*	*1.719*		*56.83*		*375.00*
United States 503 Proposed	1989	14	18	530	46	125	15	5	78	32	170
United States 503 Final	1992	41	39	3,000	1,500	300	17	18	420	100	2,800
"Final 503" % of "Proposed 503"		293%	217%	566%	3,261%	240%	113%	360%	538%	313%	1,647%
U.S. % of above countries		na	1,277%	2,330%	913%	138%	989%	na	739%	na	747%

ATTACHMENT A

KENNETH D. SCHMIDT AND ASSOCIATES
GROUNDWATER QUALITY CONSULTANTS
600 WEST SHAW, SUITE 250
FRESNO, CALIFORNIA 93704
TELEPHONE (209) 224-4412

January 15, 1999

Ms. Mary K. Shell
Harper and Shell Associates
1706 Chester Ave, Suite 553
Bakersfield, CA 93301

Re: Kern County Biosolids

Dear Mary:

Following is a summary of my oral testimony at the Kern County Board of Supervisors meeting on January 12, 1999. I understand that a resume of my professional experience has already been entered into the record.

I have firsthand experience with evaluating the impacts of sewage sludge on groundwater quality. In the early 1980's, I established a groundwater monitoring program at the Selma-Kingsburg-Fowler County Sanitation District sludge injection project west of Kingsburg. I have subsequently periodically been involved in interpreting the results of the program. I have also evaluated the influence of sludge drying beds on groundwater quality at the City of Fresno and City of Reedley wastewater treatment facilities. I am also intimately familiar with the influence of irrigation on groundwater quality.

There are a number of constituents in sewage sludge that are potential contaminants to groundwater. Included are nitrogen, boron, trace metals, radiological constituents, viruses, and organic constituents. Groundwater contamination from seepage from sludge drying beds has been documented for nitrate and a number of trace metals. Sludge from large municipalities generally contains potential contaminants generated from industrial facilities that are not present in sludge from smaller cities where such facilities are not located. Sludge from the Los Angeles area would be expected to contain much more of these constituents than, for example, in sludge from a typical city in the San Joaquin Valley. Although the experience with sludge drying beds is not directly applicable to applying sludge to farmland because of the

constituent loadings involved, many of the constituents of concern can be identified from this experience.

As you are aware, existing and proposed water-banking projects cover large areas over-lying permeable soils in Kern County. Most of the recovery wells associated with these projects are expected to have to meet water quality standards for public supply. Considering areas that may urbanize in the future (and have public supply wells) and these water-banking projects, many hundreds of wells will be subjected to testing in the future for a multitude of constituents. Based on experience, even more constituents will need to be tested in the future. Among these are biological constituents, including viruses, for which little monitoring has been done to date. In addition, boron is a potential contaminant in sewage sludge that is important for the use of well water for irrigation of many crops.

Under normal irrigation practices, one to two acre-feet of water percolates to the groundwater each year beneath each acre of irrigated land. There is substantial leaching of soluble constituents in the soil. Evidence of this leaching on the east side of the San Joaquin Valley is the long-term trend toward increasing acidity of the soils, due to the leaching of bases that were naturally in the soil. Because of such leaching, soluble constituents in the sludge applied to irrigated land can be readily leached to the groundwater. Evidence of the constituents that are soluble and relatively mobile can be gleaned from the constituents that are present in groundwater in some parts of the San Joaquin Valley. Included are nitrate, boron, arsenic, chromium, iron, manganese, uranium, selenium, and molybdenum. Little is known about biological constituents, including viruses, in groundwater in the San Joaquin Valley, but this is a significant concern where non-sterilized sludge is spread on farmland.

The fate of constituents in sludge is generally one of the following:

1) volatilization and release to the atmosphere
2) leaching and reaching the groundwater
3) remaining immobile in the soil
4) uptaken by crops.

Under sufficient loading (i.e. tons per acre), a number of constituents in sewage sludge can be leached to the groundwater. A method of controlling nitrate leaching on irrigated lands is to

match the nitrogen uptake of crops with the nitrogen applied. However, such a process is not known to have been developed for boron, trace metals, and most other constituents in the sludge.

Lastly, monitoring is absolutely necessary for land application of sewage sludge. Included is thorough monitoring of the sludge, soils, and groundwater. Costs of analyses for a comprehensive monitoring program would be staggering. The belief of certain regulatory agencies that land disposal of sludge is not a threat to groundwater quality is not based on first-hand experience with irrigated areas in the southwestern U.S.

Please call me if you have any questions.

Sincerely yours,

Kenneth D. Schmidt

KDS/bbs

PROFESSIONAL EXPERIENCE
KENNETH D. SCHMIDT
NOVEMBER 1998

Birthplace and Date

Madera, California on November 8, 1942

Degrees

B.S. Geology, Fresno State College, Fresno, California (1964)
M.S. Hydrology, University of Arizona, Tucson, Arizona (1969)
Ph.D. Hydrology, University of Arizona, Tucson, Arizona (1971)

Registration and Certification

Geologist No. 1578 in California (1970)
Geologist No. 23685 in Arizona (1989)
Geologist No. G462 in Oregon (1978)
Certified Groundwater Professional No. 193 (1986)
Hydrogeologist No. 176 in California (1995)

Society Membership

American Water Resources Association (1972)
American Water Works Association (1970)
California Water Pollution Control Federation (1972)
Fresno Geological Society (1987)
Water Pollution Control Federation (1972)

Professional Experience

June 1972 to Present: Principal, Kenneth D. Schmidt and Associates, Groundwater Quality Consultants, Fresno, California.

January 1969 to May 1972: Hydrologist, Harshbarger & Associates, Consultants in Hydrogeology, Tucson, Arizona.

December 1964 to February 1967: Engineering Geologist, Bookman-Edmonston Engineering, Inc., Arvin, California.

KENNETH D. SCHMIDT AND ASSOCIATES
GROUNDWATER QUALITY CONSULTANTS

As an engineering geologist with Bookman-Edmonston Engineering, Inc. in Arvin from 1964-67, Schmidt's primary duties included hydrogeologic studies associated with the development and operation of two large-scale recharge and groundwater recovery facilities southeast of Bakersfield, California. This experience included the basic aspects of groundwater studies, including preparing a well inventory, water-level measurements, aquifer testing, logging drill cuttings, interpreting geophysical logs, observing well drilling and construction, collecting water samples for chemical analyses from hundreds of water supply wells, and data interpretation. He conducted specific studies of land surface subsidence due to groundwater overdrafting and of the occurrence of high boron contents in groundwater northeast of Arvin. Schmidt subsequently completed a Master's thesis (in the hydrology program at the University of Arizona) in 1969 on the boron problem in that area.

As a hydrologist with Harshbarger & Associates in Tucson from 1969-72, Schmidt's primary duties involved detailed water budget studies in Southern Arizona in cooperation with the U.S. Geological Survey. In addition, he conducted extensive hydrogeologic studies as part of the FICO vs. Mines litigation south of Tucson. Included were detailed studies of subsurface geologic conditions, and development and implementation of a comprehensive water quality monitoring program at five copper mines south of Tucson. He was heavily involved in most of the field activities and data interpretation. Another investigation was also conducted on groundwater conditions and potential groundwater development for the City of Fresno. Schmidt's interest in the presence of high nitrate contents in groundwater of the Fresno urban area resulted in the subsequent completion of a Ph.D. dissertation in 1971 (also at the University of Arizona) on that topic.

As the principal of his own consulting firm since 1972, Schmidt has conducted and supervised thousands of hydrogeologic investigations in the southwest, primarily in the San Joaquin Valley of California. A number of projects in the 1970's involved groundwater development, particularly in the granitic rocks of the Sierra Nevada and also in the Middle East and Africa. In the early 1970's, he participated in development of the Tulare Lake Basin (south part of the San Joaquin Valley) water quality basin plan. As part of this project, he developed salt budgets for sub-basins, and evaluated the distribution of chemical constituents such as nitrate and boron in groundwater, and the impacts of irrigation and waste disposal facilities on groundwater quality. In the mid-1970's, Schmidt worked on development of some of the first national

guidelines for groundwater quality monitoring, as a consultant to General Electric Tempo in Santa Barbara.

By the late 1970's, Schmidt began to design, develop, and implement some of the earliest groundwater quality monitoring programs at specific sites in California. His involvement with a number of these has continued through to the present. Although a full-time consultant, he has conducted dozens of University of California extension classes and California State University, Fresno short courses since the late 1970's, on groundwater hydraulics, groundwater quality and contamination, and monitoring. Since 1973, he has periodically taught hydrogeology classes at California State University, Fresno. In addition, he conducted extensive groundwater studies as part of the EPA-sponsored 208 and 205J water quality management programs in the Fresno Water Management Plan Area during the late 1970's and mid-1980's.

In 1980, Schmidt began working on a number of projects to develop new public-supply wells in water quality problem areas. Included were hundreds of such wells in high nitrate, arsenic, fluoride, iron, manganese, hydrogen sulfide, color, DBCP, EDB, and uranium areas of the San Joaquin Valley, and areas near plumes of volatile organic chemicals. His work in this regard for dozens of cities, water utilities, and schools has continued through to the present. His firm also has worked on development of dozens of new deep irrigation wells on the west side of the valley, primarily during the 1988-93 drought.

In the mid-1980's, Schmidt was appointed by the Governor of California to the Hazardous Waste Management Council. He was selected to provide technical geologic and hydrologic input to the council, which attempted to develop a process to locate future hazardous waste disposal sites in California. From 1985 to 1988, he was a member of the National Academy of Sciences Committee on Irrigation-Induced Water Quality Problems. The committee work focused on agricultural drainage problems, including the San Joaquin Valley. For a number of years following the inception of the U.S. Geological Survey National Water Quality Assessment Program in the mid-1980's, Schmidt was a member of a national advisory committee for that program. In 1987, he was named the Chairman of the Groundwater Sub-Committee of the Technical Advisory Committee for the San Joaquin Valley Agricultural Drainage Program. In 1988, Schmidt was appointed an Adjunct Professor in the Department of Civil Engineering at California State University, Fresno, where he presented short courses. In 1993, he was appointed to a Department Advisory Committee that evaluates the

hydrology program at the University of Arizona. Since 1996, he has chaired that committee. From 1992-98, Schmidt was a member of the Industrial Advisory Council in the College of Engineering at the University of Arizona. In 1996, Schmidt was appointed to the newly formed advisory committee for the School of Natural Sciences at California State University, Fresno. In 1997, he was appointed to the newly formed advisory committee for the Land, Air, and Water Resources Department at the University of California at Davis.

During the past two decades, Kenneth D. Schmidt and Associates were involved with a number of groundwater contamination investigations and groundwater remediation projects. Included are a number of landfills, dry cleaners, brine ponds, septic tanks, food processing wastewater ponds, mining wastes, and municipal sewage sludge and effluent percolation facilities. The firm has conducted and has completed numerous groundwater monitoring programs and groundwater contamination assessments, pursuant to requirements of the California Water Quality Control Board, Central Valley, Lahonton, San Francisco Bay, and Central Coastal Regions.

Since the mid-1990's, the firm has been a leader in groundwater resource evaluations in the San Joaquin Valley. The firm has been involved with several large-scale recharge and water banking projects, including: the Arvin-Edison Water Storage District in Kern County, the Semitropic Water Banking Project in the Safter-Wasco area, and the Kern Fan Water Banking Project west of Bakersfield. The firm has also worked on several agricultural drainage projects in western Fresno County and Kern County. In recent years the firm has completed detailed groundwater evaluations for development of Water Management Plans in the Cities of Fresno, Tulare, Clovis, and Madera. The firm has participated in several AB 3030 groundwater management plans. Ken Schmidt has also provided expert witness services for numerous litigation cases involving groundwater in the San Joaquin Valley. The firm conducted detailed hydrogeologic studies in the mid-1990's along the west side of the San Joaquin Valley for a water transfer policy by the Central California Irrigation District. In recent years, the firm has conducted detailed groundwater studies associated with EIRs for existing and proposed gravel mines in Tulare, Fresno, Madera, and Merced Counties.

Selected Clientele

Aermotor Pumps, Arkansas.
Angiola Water District, Corcoran.
Artesia Ready Mix, Lemoncove.

Bakman Water Co., Fresno.
Boyle Engineering Corporation, Fresno.
Britz Farms, Five Points.
Buena Vista Water Storage District, Buttonwillow.
Calavaras Materials, Fresno.
California Portland Cement Co., Mojave.
CalMat Co., Los Angeles.
Carollo Engineers, Fresno and Sacramento.
Central California Irrigation District, Los Banos.
CIBA GEIGY, Sanger.
City of Atwater, Public Works Department.
City of Clovis, Public Works Department.
City of Corcoran, Public Works Department.
City of Dinuba, Public Works Department.
City of Fresno, Public Works Department and Water Division.
City of Hanford, Public Works Department.
City of Kerman, Public Works Department.
City of Lindsay, Public Works Department.
City of Madera, Public Works Department.
City of Mendota, Public Works Department.
City of Modesto, Public Works Department.
City of Reedley, Public Works Department.
City of Sanger, Public Works Department.
City of Santa Clara, Department of Public Works.
City of Turlock, Public Works Department.
City of Woodlake.
Columbia Canal Company, Firebaugh.
County of Fresno, Departments of Public Works, Planning, and Environmental Health.
County of Madera, Department of Public Works.
County of Tulare, Department of Public Works.
Dole Fruit & Nut Co., Fresno.
Eastside Water District, Stanislaus County.
Five Points Ranch, Five Points.
The Garlic Company, Lerdo.
Greben and Associates, Sacramento.
The Grupe Development Co., Fresno.
Guardian Glass Plant, Kingsburg.
GWF Power Systems, Inc., Walnut Creek.
Harris Ranch, Coalinga.
Holly Sugar Co., Tracy and Imperial.
James Irrigation District, San Joaquin.
Dee Jaspar and Associates, Bakersfield.
Kenetech Alternative Power Systems, Meriden, Conn.
Kern County Agricultural Water Users, Bakersfield.
Kern County Water Agency, Bakersfield.

Kern Delta Water District, Greenfield.
Kern Water Bank Authority, Cawelo.
Laguna Irrigation District, Riverdale.
Lawrence Livermore National Laboratory, Livermore.
Madera Irrigation District.
Mammoth Community Water District, Mammoth Lakes.
Mariposa Public Utility District, Mariposa.
McCormick, Barstow, Sheppard, Wayte and Carruth, Fresno.
McFarland Mutual Water Company.
Miller, Nelson, and Briggs, Sacramento.
Monterey County Flood Control and Water Conservation District, Salinas.
Newland Land Co., New Columbia Ranch, Firebaugh.
O'Neill Farming Enterprises, Five Points.
Oakridge American, Bakersfield.
Oildale Mutual Water Co., Bakersfield.
Paramount Farms, Cawelo.
Provost & Pritchard Engineering Group, Fresno.
Quad Engineering, Visalia.
Red Rock Ranch, Five Points.
Rogers Helicopters, Inc., Clovis.
San Joaquin Valley Drainage Program, Sacramento.
San Joaquin River Exchange Contractors Authority, Los Banos.
Selma-Kingsburg-Fowler County Sanitation District, Kingsburg.
Sierra Valley Groundwater Management District, Loyalton.
Sonora Mining Corporation, Jamestown.
Sperry New Holland, Fowler.
Spreckels Sugar Company, Mendota, and Woodland.
Gilmartin and LeBerthon, L.L.P., Santa Monica.
Sun-Maid Growers of California, Kingsburg.
Sun World, Bakersfield.
Thermo-Electron Energy Systems, Mendota.
Town of East Orosi.
Ultra Power, Inc., Irvine.
Valley Perforating Co., Bakersfield.
Vaughn Water Co., Bakersfield.
West Kern Water District, Taft.
Wilson Development Co., Fresno.
Yamabe and Horn Engineering, Fresno.

Publications

"The Use of Chemical Hydrographs in Groundwater Quality Studies," in Hydrology and Water Resources in Arizona and the Southwest, vol. 1, Arizona Section AWRA, pp 211-223, 1971.

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"A Groundwater Quality Monitoring Methodology," Journal AWWA, vol. 68, No. 11, pp 586-593, with D.K. Todd, R.M. Tinlin, and L.G. Everett, 1976.

"Water Quality Variations for Pumping Wells," Ground Water, vol. 15, No. 2, pp 130-137, 1977.

"Protection of Groundwater from Nonpoint Sources of Pollution," Proceedings of Symposium on Drinking Water Quality Enhancement through Source Protection, American Chemical Society, Division of Environmental Chemistry, New Orleans, Louisiana, March 20-25, 1977, Ann Arbor Science Publishers, Inc., pp 257-273, 1977.

"Impact of Land Treatment of Wastewater on Groundwater," Proceedings of National Conference on Environmental Engineering, Kansas City, Missouri, July 10-12, 1978, University of Missouri-Columbia, pp 118-125, 1978.

"The 208 Planning Approach to Groundwater Protection - What is Wrong and What Can be Done About It?," Ground Water, vol. 17, No. 2, pp 148-153, 1979.

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"Monitoring Groundwater Quality at State Permitted Sites in California," Proceedings of the Thirteenth Biennial Conference on Groundwater, Irvine, California, September 14-15, 1981, California Water Resources Center Report No. 53, pp 87-91, 1981.

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KERN FOOD GROWERS AGAINST SEWAGE SLUDGE

Agricare, Inc. Wm. Bolthouse Farms D.M. Camp & Sons Anton Caratan & Son
M. Caratan, Inc. Dole No. American Deciduous Howard Frick Farm
Giumarra Vineyards Grimmway Farms Jasmine Vineyards Pandol & Sons
Sun World, International V.B.Z. Farms Marko Zaninovich

To: The State Water Resources Control Board
From: The Kern Food Growers Against Sewage Sludge
Submitted By: Paul Gibboney, M.S. (phone 661-725-2566)
Paul Gibboney Aug 13, 1999

ATTACHMENT C
BRIEF SELECTED COMMENTS ON SWRCB DRAFT EIR ON GENERAL WASTE DISCHARGE REQUIREMENTS FOR LAND APPLICATION OF SEWAGE SLUDGE (SUPPORTING SCIENTIFIC DOCUMENTS ARE ATTACHED)

Refer to DEIR Page 2-13

There can be no guarantee that there will not be runoff from sludge application sites. Barriers of 33 feet are inadequate.

a) Witness the off site movement of sludge in Cantil where the floodwaters carried the material onto homeowner property.
b) Floodwaters in 1998 carried soil and debris from miles of adjacent farmland directly into the Friant Kern Canal.

26-14

Refer to DEIR Page 2-15

Groundwater monitoring should be also conducted for Chromium VI which is very mobile. A groundwater site in the Valley has been contaminated with CrVI from a non-native source.

Private communication

26-15

There has been very limited or no fate studies of biologically active compounds which trigger or block estrogen effects, phthalate esters or pharmaceutical compounds. Recently researchers have relied on very basic physical and chemical property data to use in models that attempt to predict environmental behavior and fate of these compounds. This is described by the researchers as "a first attempt" and also they state "it is important to

26-16

consider the potentially large errors associated with such estimates. However… they represent a best estimate in the absence of measured data."

Alcock 1998

26-16 (cont)

Application should not be permitted to soil within 25 feet of groundwater. Applications should not be made over the groundwater at all. Not only are some metals such as CrVI and Cd and some organic contaminants a threat but pathogens are as well. Polio virus was detected three meters deep in Arizona. Did the researchers look deeper than that? Once an organism has migrated that deeply into soil it is less vulnerable to degradation by biological forces.

Straub, et.al.,1993

26-17

If sludge is not good enough for the GO Exclusion Areas such as the Santa Monica Mountains. It is not good enough for our Valley.

26-18

Refer to DEIR Page 3-14

It is true the colloids, carbonates and complexes often times do retain metals. But not always and not always irreversibly.

1) Surfactants, a major organic component appear to concentrate in sludge and have been shown to desorb some pollutants from soils.

Dentel, et.al.,1993

2) Humic acids from sludge will not remain in the soil indefinitely. As they oxidize and degrade, the heavy metals they retain will be released back into the soil solution becoming plant available and vulnerable to leaching.

McBride, 1995
McBride, 1998

3) Many of our valley soils have less than 10% clay and therefore will not contribute significantly to heavy metal or other contaminant retention.

Personal observations

4) Heavy metals from sludge do not always behave in the same predictable manner as metals from an inorganic source such as native materials or fertilizer. Sludge metals are often non-reactive and can be found in a soluble or colloidal state very susceptible to leaching.

McBride 1995

26-19

Transport of some metals has been observed in percolating water at a field site where sludge was applied ten years earlier.
Harrison, et.al.,1997

Up to 60% of some sludge applied heavy metals have been "lost" in a mass balance study in a silt loam soil. Those metals did not remain where they were applied. Baveye, et.al.,1999

26-19 (cont)

Lead may have limited mobility, but it was found recently in extremely high levels in a food crop in two separate states. Lead arsenate, a banned pesticide had been used in now long gone orchards. Many years later that same lead was accumulated by a food crop and nearly entered the market, as baby food. Personal Correspondence 1998

Refer to DEIR Page 3-15

The statement that sandy, low organic matter, acid soils are rare in California is absolutely wrong. Light sandy soils are preferred by root crops which is why so many carrots, potatoes and other crops are grown here.

- At least 50% of the Kern County Valley soils can be described as light having a significant percentage of sand and a fairly rapid infiltration rate.
- Nearly 100% of the Valley soils have less than 2% organic matter, unless amendments have been applied.
- Many Valley soils are neutral to acidic. Farming activities which includes acidifying chemicals, irrigation and weekly buffered soils in some cases has resulted in soils that now have a pH of 6.5 or less in areas that at one time tested at 7.5 or more. Once the buffer is broken, the soil chemistry is subject to rapid changes. Lime is now becoming an increasingly common soil amendment. Ferry, 1976
  Ferry, 1967
  USDA, 1945

26-20

Refer to DEIR Page 3-15

The statement of "low mobility of biosolids derived metals in typical soil environments has been demonstrated."

In fact, there is much evidence that biosolids derived metals do move within the soil profile and present a threat to groundwater, regardless of the depth to groundwater. Baveye, et.al.,1999
Chaudri, et.al.,1999
Martinez, et.al.,1998

26-21

Shanablea, et.al.,1999
McBride, 1995
McBride, 1998

26-21 (cont)

Refer to DEIR Page 3-16

If even a very small fraction of a highly toxic element such as Hg is converted into a more mobile or volatile form as may be the case for conversion of the immobile Hg t2 ion to methymercury or Hg° the risk to groundwater and the environment could be significant. McBride, 1995

26-22

Refer to DEIR Page 3-17 & 5-33

Synthetic Organic Compounds (SOC)

"Until there is sufficient justification (i.e., a potentially significant health risk associated with biosolids is identified), it is unlikely that regulations will be developed to establish limitations on the SOCs in biosolids."

This philosophy is the complete opposite of EPA pesticide policy where pesticides must go through exhaustive testing and be proven safe before used. EPA in the case of sludge, which has literally thousands of active ingredients of inconsistent quality, has allowed its nearly indiscriminate use and demands that society and the environment must prove harm before sludge is properly regulated. This approach is neither scientific, prudent nor protective.

26-23

There is much evidence that SOCs present a risk.

- Levels of major mutagenic and carcinogenic Polycyclic Aromatic Hydrocarbons are found in industrialized sludge. Bodzek, 1999
- French researchers have determined that agricultural volatilization of sludge's organic pollutant is a major risk and have imposed limits on chlorobiphenyls. Dupont, 1999
- Nonylphenols in sludge are persistent and toxic and effect plants and aquatic organisms including significant negative effects on segmented seaworms. Nonylphenols present serious health risks to humans.
  Hansen, et.al.,1999
  Lin, et.al.,1999
- Surfactants, both anionic and cationic are not destroyed during sludge treatment but are concentrated. This has considerable implications due

to the result that the surfactants can mobilize organic pollutants in land application sites and facilitate groundwater contamination.
Dentel, 1993

- a) root crops will retain several organic compounds.
  b) some chlorophenols are predicted to have a high potential for crop uptake and translocation.
  c) some organic chemicals also have a high potential to leach to groundwater including chloroanilines, mononitrophenols, dinitrotoluene, and bis(2-chloroethoxy) methane, if they are not first taken up by the crop.
  d) foliar uptake plays a major role in plant uptake and is particularly important for forage systems where subsequent bioaccumulation into grazing animals becomes a significant consideration.
  Duarte-Davidson, et.al., 1996

- A paper in 1999 was published by British researchers that found scientific data so limited that physical and chemical characteristics were used in very basic models to attempt to predict environmental fate and risk. "It is important to consider the potentially large errors associated with such estimates. However, at this stage they represent a best estimate in the absence of measured data."
  a) Chlorinated Paraffins
  i) Sufficiently persistent to be capable of long-range atmospheric transport.
  ii) Meets criteria as a Persistent Organic Pollutant.
  iii) Classified by IARC as a 'possible carcinogen to humans'
  b) PCN'S
  i) Several have dioxin activity.
  ii) Strongly bioaccumulating, found in Swedish fish.
  c) DEHP
  i) European Union Scientific Committee for Food has set up limits for Tolerable Daily Intake.
  ii) Detected in nearly all of Swedish Sludge.
  iii) Possibly oestrogenic.
  d) Pharmaceuticals
  i) Metabolites originating from medical substances have been measured in groundwater and it is not possible to predict their environmental fate.
  ii) Information about environmental behavior and ecotoxicology of these biologically active substances is generally unavailable.

26-23 (cont)

iii) The extent of transformations and significance of partial degradation to produce different metabolites has not been investigated to date. Alock, et.al., 1999

26-23 (cont)

Refer to DEIR Page 5-35

Exposure to Aerosols

- DNA finger printing identified aerosolized Clostridia from a sewage sludge pile. Dowd, et.al., 1999
- Polychlorinated biphenyls are now regulated in France due to the hazard presented from volatilization from sludge. Dupont, et.al., 1999
- "The rapid detection of pathogenic microbial species in aerosols is of paramount importance considering its public health and animal husbandry implications." Pena, et.al., 1999
- "Volatile mercury coumpounds have been speciated in gases evolved from fermentation of sewage sludge as well as municipal waste." Sommar, et.al.

26-24

Refer to DEIR Page 3-28

The statements are made that GO prohibits discharges that cause pollution and that the RWQCB are responsible to review information.

- The simple statement of prohibition means nothing especially during flooding.
- It has already been proven at Cantil that the RWQCB has been particularly ineffective at preventing offsite movement, as was cited in the California State Auditor report. In fact, the Lahontan district still does not have a quorum, and therefore can not conduct business.

26-25

Refer to DEIR Page 3-35

- How was the "sufficient depth to groundwater" determined to be protective?
  Confining layers reduce the rate of flow between zones, they do not eliminate flow. And in fact, conjunctive use plans based on hydrogeologic data indicate that there is the opportunity for a rapid infiltration of water and contaminants in a significant portion of the valley floor. Rector, personal communication

26-26

- Again, the probability of metals transport is high. The assumptions made are incorrect. Earlier in this report it was stated that some heavy metals are higher than the national average, there are many areas of low pH, low organic matter, permeable soils and high irrigation application rates.
- To reiterate, the potential for surface water runoff of biosolids is not low. In addition to the flooding in Cantil as reported in the State Auditors Report and into the Friant Kern Canal which was witnessed by many, flood waters moved soil and sludge offsite through a cattle pasture into the National Wildlife Refuge in north Kern County in the late winter and spring of 1998. It is very possible that the flood waters carried Salmonella, which could decimate the migratory waterfowl that frequent this site. In addition, that area, like Kesterson is high in selenium. Selenium additions from sludge will accumulate and again threaten the wildlife population. Other pathogens such as Campylobacter, Listeria, Giardia, Cryptosporidium, tapeworms, E Coli including E Coli: 0157 as well as salmonella likely were in that runoff that passed through the cattle and into the Wildlife Refuge. Not only are the domestic and wild animals threatened but ground feeding birds such as ducks, blackbirds, starlings, crows and ravens are known vectors of pathogens, especially bacteria. Atwill, personal conversation
  Phillips, personal conversation
  Personal observations

26-26 (cont)

There are numerous citings in the scientific literature identifying sewage sludge and effluent as the source of contaminants, which resulted in immunosuppression, and debilitation of fish and especially altering sexual characteristics of fish and potentially other species due to the presence of many oestrogenic compounds.
Austin, 1999
Batty, et.al., 1999
Hegrenes, 1999
Larson, et.al., 1999
Panter, et.al., 1999
Smith, et.al., 1999 (2)
Tyler, et.al., 1

Refer to DEIR Page 3-37

The statement "If it is found in the future that the land application of biosolids is responsible for unlawful disposal of hazardous waste, cleanup actions (if required) would be taken by the responsible parties" does not reflect a properly protective philosophy. It is very likely that currently legal

26-27

chemicals found in sludge will be restricted in the future as more is learned about them. In view of our current ignorance but obvious indications of likely environmental consequences of the land application of sludge, how can it be considered to be protective or rational to permit the application of this material? Indeed, how is a contaminated aquifer reclaimed and who ultimately bears the cost? "We have 300 platers in Chicago, electroplaters that discharge lead, cadmium, cyanide. We have plastic manufacturers that discharge lots of phenols. We don't have any limit on phenols in our sewers. So that environment is not friendly to any HIV particle, believe me." Cecil, et.al., 1997 (WEF)

26-27 (cont)

Refer to DEIR Page 4-6

"At sites having a moderate limitation, biosolids may be applied only where the crop is not particularly sensitive to metals and nutrient imbalances."

- EPA conducted tests on only a few relatively metal-insensitive crops such as corn. McBride, 1995
  McBride, 1997
- "A given metal... can be hazardous to those who consume the produce, whether or not there was harm to the plants."...

  "the result for multiple toxicities need additional consideration"

  "It can be expected that multiple-element toxicities will occur in high pH soil as well as on low pH soils"

  "Studies need to involve at least up to 40 or more years"

  "Some growers have used the products for as much as 40 years continuously and toxicities are showing on plants and proved by analyses... Five metals, cadmium, copper, lead, nickel and zinc are often elevated in soil extracts and leaf analyses" Wallace, 1994

26-28

How will post treatment-cropping options be limited to those crops which are not sensitive to metals and do not accumulate potentially toxic levels of heavy metals?

Case in point:
In 1998 the U.S.F.D.A. discovered high levels of lead in two separate incidents in a food crop. One crop was destined for baby food. Source

of the lead was from past use of lead arsenate in the previous apple orchards ending about 1950.

"Exposure to lead can retard neurological development in young children and result in permanent loss of intelligence. FDA believes lead, at any level of exposure, acts negatively on the human nervous system and the agency has not set a permissible level of exposure in flood"

"FDA does not have a good understanding of how elevated levels of lead in soil contribute to high lead levels in produce commodities"
Private communication, 1998

26-28 (cont)

Refer to DEIR Page 4-7

Synergistic effects do not make the effects additive. Synergism results in an effect greater than the additive sum. The difference, in understanding the definition of synergism can be several orders of magnitude.

26-29

Refer to DEIR Page 4-9

"biosolids have been land applied to California soils for more than 20 years in some areas and no problems related to heavy metals have been documented."

This statement is not correct please refer to Wallace, 1994 above.
Wallace, personal communication

"...Only a small proportion (perhaps 10%-15%) of California soils have condition that would lend themselves to potential problems..." This statement is not based on a reasonable scientific interpretation of available data.
Rector, personal Communication
USDA, 1945
Ferry, 1967, 1976

26-30

Refer to DEIR Page 4-10

There is evidence that sludge does have a significant adverse impact on soil microorganisms, the very foundation of our soil productivity.

- "the size and diversity of arbuscular mycorrhizal fungi populations were modified in metal polluted soils, even in those with metal concentrations that were below the upper limits accepted by the European Union for agricultural soils." Del Val, et.al. 1999

26-31

- "the main conclusion of this study are that, two mycorrhizal species are strongly inhibited by heavy metals..." Del Val, et.al. 1999
- "Sludge induced heavy metal toxicity adversely effected a Rhizobium species thus reducing nitrogen fixation in two plant species"
Ibekwe, et.al.,1997
- Cadmium rich sludge had detrimental effects on Collembola (Insect order-springtail) populations. Bruce, et.al.,1997

26-31 (cont)

On what scientific basis is the statement made that many of the SOCs would be expected to biodegrade over time?

Refer to DEIR Page 4-11

The statement that "it appears unlikely that regulated heavy metals would accumulate in pastures" or "affect forage productivity or animal health" is incorrect. Growers of alfalfa and other forage crops have gradually reclaimed soil from molybdenum and selenium for over 40 years in many cases. Even now approximately 25% of Kern County hay has elevated Mo levels. Molybdenosis, when severe, can not be treated in animals by diet supplements. Hay growers could potentially lose markets due to the real or perceived molybdenum risk. In addition, locoweed (Astragalus asymmetricus) accumulates selenium as does other vegetation and also presents a toxic hazard to livestock. Phillips, 1998

26-32

Public Health

The use of a broad based disease survey in an attempt to 'document' that sludge is not responsible for an increase in illness is meaningless. Health department data is not designed for this purpose nor is it sensitive enough to detect a relatively small event due to sludge borne pathogens. This procedure is statistically invalid and should have no bearing in a scientific discussion.

26-33

Refer to DEIR Page 5-9

"Living things have evolved with these natural substances ("endocrine disrupters") and have mechanisms to metabolize or degrade them so they do not bioaccumulate."

This statement is vague, general, simplistic and is not supported in this DEIR by scientific fact.

26-34

"these compounds occur as mixtures in the environment and their combined action has not been well studied. A combination of any two of these chemicals produced a synergistic increase in activity. That is the mixture was 160 to 1600 times more potent than the individual chemcials."

"Hydrolyated polychlorinated biphenyls (PCBs) activated estrogen-dependent activity, including an endometrial cancer cell line. A mixture of two PCBs behaved synergistically."

"Apparently synergistic estrogenic effects of environmental chemicals were observed in cultures of fish hepatocytes. This data and the above reports suggest that the estrogenic potency of some environmental chemicals, when tested singly, may be underestimated."

"These findings also have general biological significance, because ovarian and phytoestrogens act synergistically. The possibility for synergistic action of apparently inactive chemicals functioning as hormones may represent a previously uncharacterized levels of receptor-mediated gene regulation. The interaction of mulitiple chemicals with the estrogen receptor suggests a complex interplay between environmental signals and biological systems." Arnold, et.al., 1996

26-34 (cont)

Refer to DEIR Page 5-12

A dipteran (the fly order) has been shown to be found in greater numbers in sludged fields. Hovemeyer, 1999

26-35

Refer to DEIR Page 5-12 and 5-14

It is documented that various bird species and other wildlife including squirrels and coyotes can vector pathogens which can threaten livestock, wildlife and humans. Cyptosporidium can survive for a year outside of a host. Cypto was responsible for 400,000 illnesses and approximately 100 deaths in Milwaukee in 1993. The source was a sewage treatment facility. There are no antibiotics available for this protozoan and no water treatment either.
Atwill, 1998
Phillips, personal communication
Suslow, 1998

Measly beef in livestock is caused by the beef tapeworm. Humans are a required part of the lifecycle of the tapeworm. Measly beef is still found by inspectors in California raised beef cattle. Human feces are infecting

26-36

cattle with tapeworms which can make the meat unfit for sale. Sludge also contains ascaris eggs which survive the limited treatment. The eggs can remain viable for years. The application of sludge to pasture and forage presents a significant risk to the livestock industry.
Mass, 1998
Strauch, 1991

An edidemiological causal relationship was found between the agricultural utilisation of municipal sewage sludge and salmonella infections in cattle herds. In an analysis of nearly 27,000 cases within ten years there was unequivocal accumulation of infections with salmonellas.
Strauch, 1991

26-36 (cont)

Refer to DEIR Page 5-15

An infectious dose requires only a single pathogen in the case of protozoans, worms and viruses.

Recent research has shown that E.Coli 0157:H7 is more resistant than standard E.Coli to dry conditions, freezing and acid conditions. Environmental stresses that inactivate conventional E.Coli are much better tolerated by E.Coli 0157:H7. An additional risk feature result is from the very low number of contaminating cells required for infection.
Suslow, 1998

26-37

Refer to DEIR Page 5-15

The 1993 Cryptosporidium outbreak in Milwaukee was the result of a water borne pathogen. This disease is so serious that Los Angeles Metropolitan Water District has spent $3.3 million on a Cryptosporidium Action Plan, as of 1997. To date there is no commercially feasible domestic water treatment for Cryptosporidium. MWD News Release,1997

26-38

Refer to DEIR Page 5-23

Impacts and Mitigation Measures

"...there is no indication that there is any more risk associated with biosolids than with other sources of these pathogens." (DEIR statement)

- "the presence of thermophilic campylobacters and arcobacter was investigated in four types of sludge...they were less sensitive to anaerobic digestion than fecal bacteria...the land application of digested sludges may cause high risks of infection." Stampi, et.al., 1999

26-39

- "Hygienic measures should therefore be taken to control the spread of these fungi in the environment of human communities, and to avoid mycotic infections among farmers" Ali-Shtayeh, et.al., 1998

"Sewage sludges usually do contain considerable amounts of pathogens even after the purification process"

"farmers want to seal their farms off from further danger of infection. In recent years many farmers have come to believe that their soil was being slowly but surely turned into the rubbish bin of the nation"

"Bacteria range depends on the epidemiological conditions in the particular region"

"more than 100 viruses are excreted from humans in the faeces. Nearly everyday new ones are added, some of which still await identification...The clinical sign which they provoke may have trivial to severe or even fatal consequences."

"The range of parasites...has certainly been enlarged by the influx of immigrant workers refugees and resettled persons from various regions of the globe"

"One should not underestimate the significance of yeasts and fungi for public health, especially in connection with the agricultural utilization of sewage sludge. At present the significance of these microbes in public has not been properly estimated"

"Most pathogenic agents can survive the treatment processes of waste water...sewage sludge is rightly described as a concentrate of pathogens."

"This investigation shows that it is a perversion of hygienic principles for more and more sewage to be collected and treated with more sophisticated methods in plants if the sludge – which consists mainly of human faeces – is then distributed over large areas without being disinfected"

Strauch, 1991

26-39 (cont)

Refer to DEIR Page 5-25

Anaerobic digestion is not necessarily effective at reducing bacterial hazards. See research by Strauch, Scampi and Suslow as previously

26-40

presented. EPA allows 2 million E.Coli bacteria per dried gram of class B sludge. This is not a small number. Testing for other pathogens is not required. A single bacterial analysis is not necessarily representative of the presence of other pathogens.

26-40 (cont)

Refer to DEIR Page 5-26 and 5-27

Several references have been made to the study by Dorn, et.al., (1985) throughout this draft EIR. Much of what is presented in this draft concerning the Dorn papers, a.k.a. the Ohio Health Study is not correct.

- Only 27% of the 93 farms completed the full three year study
- The mathematical calculations in the DEIR are incorrect. A metric ton equals 1.102 tons and a hectare equals 2.471 acres. At 25% solids (75% moisture) 2-10 dry metric tons would be equivalent to 3.6-17.8 wet tons per acre, not 20-90 as was stated. Furthermore, these application rates are significantly less than the calculated 30 wet tons per acre being applied in Kern County.
- The number of acres treated and therefore the opportunity for exposure and contamination is much less in the Ohio Study compared to Kern County. The Ohio Study average treated acres ranged between 37 and 116. The smallest permitted site in Kern County is 560 acres.
- There is no description of the Ohio Study sludge. It is unknown what the treatment was or what pathogens, heavy metals, organics or other contaminants were applied.
- Key statements found in the four papers that make up the Ohio Health Study have been omitted from this Draft EIR.

  i) "Significant cadmium and lead accumulations were found in the kidneys of calves grazing sludge treated pastures." (pg. 360)
  ii) "the possibility of PCB and other toxic organics reaching crop land is an issue of concern to farmers...More research is needed." (pg. 4)
  iii) "Caution should be exercised in using these data to predict health risks associated with sludges containing higher levels of disease agents and with higher sludge application rates and larger acreages treated per farm than used in this study...there remain questions about human and animal health consequences" (pg. 332)

  Dorn, et.al., 1985
  Reddy, et.al., 1985 (2)
  Brown, 1985

26-41

Refer to DEIR Page 5-27 and 5-29

The reliance on county employees who are not trained medical officers or epidemiologists for anecdotal information as to any observed health effects related to sludge applications is not a scientifically or statistically sound procedure. Except in the case of a profound incident, the observations of these employees are without merit and are not at all indicative of the safety of sewage sludge. 26-42

5-35

Air Borne Health Risks

- "High concentrations of fungus (Aspergillus fumigutus) near composting sites (of sewage sludge) could represent a health hazard to workers" Kothary, et.al., 1984 26-43

Effects on Wildlife and Fish

As previously discussed in this paper, metals, such as Selenium pathogens, such as Salmonella, and synthetic organic chemicals such as those that regulate hormonal activity all present significant threats to fish and wildlife. 26-44

26-1. The commenter's concerns about land application of biosolids are noted.

26-2. The proposed GO contains specific requirements to protect groundwater and surface water from regulated contaminants that may be found in biosolids. The draft EIR analyzes the proposed GO's possible environmental effects on a wide range of resources, including groundwater and surface water (see Chapter 3 of the draft EIR).

26-3. The commenter's information about the agricultural industry is noted. No response is necessary.

26-4. Master Responses 13 and 14 describe the SWRCB's basis for evaluating potential groundwater impacts under the proposed GO. SWRCB staff acknowledge that there is controversy over selected components of the Part 503 risk assessment process. However, the proposed GO provides protection for groundwater through conservative assumptions in the Part 503 process for groundwater pathway risk assessments, additional protective and conservative measures included in the proposed GO, and the requirement for monitoring in areas with shallow groundwater.

26-5. Refer to Response to Comment 26-4.

26-6. See Master Response 12.

26-7. The commenter's opinion about food safety is noted. No response is necessary.

26-8. See Master Response 1.

26-9. The commenter's opinions about farmland as a unique and valuable public resource, the need to protect the state's water supply, and the preferred alternative are noted. No response is necessary. The SWRCB staff believes that the program in the proposed GO protects irrigated farmland and the state's water supply.

26-10. The rationale for adding pollutants for regulation and setting standards at a contaminant level other than that in the Part 503 regulations is unsubstantiated and requires further explanation. Such changes are not warranted at this time.

26-11. As noted in some of the following responses to comments, the information provided by the commenter has been reviewed in preparing the final EIR. No response is necessary.

26-12. Comment noted. Currently, groundwater monitoring is required on an annual basis. This frequency is adequate because of the relatively slow movement of groundwater. All

laboratories used for compliance with the proposed GO must be certified by the California Department of Health Services. Self monitoring, with oversight by the State, has shown to be effective in measuring compliance with waste discharge requirements.

26-13. Information regarding Kern County's agricultural production is noted. No comment is required.

26-14. Master Responses 13 and 17 describe the analysis of potential surface water quality impacts in the EIR and the basis for determining that potential impacts would be less than significant. The comment describes a case where biosolids were applied in an area subject to flooding-related erosion and washout. In the cited case examples, the comment presumes that discharging biosolids in floodwaters will degrade water quality.

SWRCB staff disagrees with the comment's implied presumptions. Primarily, the proposed GO would differ from the cited examples because biosolids application would be prohibited in areas subject to erosion and washout. In addition, determining whether biosolids application poses an unacceptable risk to water quality is generally defined by the applicable water quality standards for the nearby surface or groundwater resources. Based on the risk assessments conducted for the Part 503 regulations, and additional setback distances and conservative measures required under the proposed GO, the SWRCB staff is confident that the risk of water quality degradation can be lowered to acceptable levels. RWQCB staff is trained and authorized to ensure that protective measures are used at a proposed application project site to reduce the probability of erosion and washout. Therefore, if flooding-related washout did occur on an application project conducted under the proposed GO, it would be very infrequent. Finally, storms large enough to create a washout of biosolids would not necessarily cause exceedances of water quality standards. Flows are generally so large during such storms that the small amount of biosolids in the flood flow would be very diluted.

26-15. See Master Response 4.

26-16. The issue of the presence and fate of biologically active compounds in biosolids which can serve as potential endocrine-disruptors was discussed in draft EIR Appendix E, Part 3, and in the Responses to Comments 44-5 and 44-6.

26-17. The concerns regarding the application of biosolids over groundwater basins is noted. The issue of metals was addressed in the draft EIR and in Responses to Comments 26-15 and 26-19. The issue of pathogen transport to groundwater through soils was discussed in Responses to Comments 21-19 and 21-25.

26-18. Areas in the Santa Monica Mountain Zone have sludge application sites ongoing under individual waste discharge requirements. Exclusion areas are not prohibition sites, just locations believed best approached on a site-specific basis.

26-19. Master Responses 13, 14, 15, 16, and 17 generally describe the basis for the analysis of potential surface and groundwater quality impacts in the EIR with respect to EPA's risk assessments conducted for the Part 503 regulations, additional protective measures in the proposed GO, and the authority of RWQCB staff to use monitoring and professional judgement to determine whether a specific biosolids application project would protect water quality. The conservative factors and assumptions used by EPA for the Part 503 regulations development process considered a wide range of conditions. The specific case study situations and characteristics in the comment are not inconsistent with the type of factors considered in the Part 503 process. The case studies cited in the comment are reason for concern, but the SWRCB staff believes the Part 503 risk assessment and the conservative approach to regulation in the proposed GO indicate biosolids can be safely applied. Therefore, the results of Part 503 risk assessments should also be consistent with the cited examples.

26-20. This comment pertains to the statement made on page 3-15 of the draft EIR, that "sandy, low organic, acid soils are rare in California." The comment author believes that such conditions are common in the San Joaquin Valley and that the statement misrepresents soil conditions in California.

This quote was taken out of context and only partially abstracted. Broad generalizations about the soils of California are difficult to make and are open to criticism, but were presented in an attempt to place the potential issue of biosolids metals applications on agricultural lands and land productivity in a statewide perspective. The draft EIR sentence went on to state that such conditions (sandy, low organic matter content, acidic soils) occur on recently formed sandy alluvial fan soils associated with the granitic foothills of the southern San Joaquin Valley. In fact, extensive valley areas of eastern Kern, Fresno, Stanislaus and San Joaquin counties have sandy, low organic matter content, and slightly acidic to neutral soil conditions. Sandy, moderately to strongly acidic soil conditions are not common in the southern San Joaquin Valley and are probably rare in California. Note that the USDA Soil Survey Manual defines "moderately acid" as soil with pH of 5.6 to 6.0 and "strongly acid" soil as pH 5.1 to 5.5.

The commenter correctly states that these soil conditions are least able to bind up metals and other toxic substances and are most likely to allow leaching of any biosolids-associated mobile toxic substances to groundwater. The proposed GO addresses such potentially adverse soil conditions (from a biosolids application perspective) in Mitigation Measure 4-1, which restricts the applicability of the proposed GO where such conditions might be encountered. Portions of Kern and Fresno Counties (and other locations in California), where strongly acidic soil conditions occur, may be excluded from the proposed GO, and there may be crop choice limits for soils with moderate acidity and low cation exchange capacities. In these situations, a site-specific waste discharge investigation/permit application would be required.

26-21. This comment pertains to the draft EIR statement that "low mobility" of biosolids-derived metals has been demonstrated. It provides several references that dispute this statement and indicate the opinion that there is a potential threat to groundwater, including deep groundwater, from biosolids-applied metals moving through the soil profile.

The commenter is correct (see also Response to Comment 21-57). However, SWRCB staff wishes to qualify this statement. There may be a potential groundwater threat only in certain hydro geologic environments from application of biosolids high in certain metals. The greatest potential threat occurs on sandy, acidic soils where groundwater is relatively close to the surface. The metal of particular concern is cadmium. As mentioned above, these are the environments least capable of binding and retaining applied metals and represent the most permeable soils where soil water can be transported to relatively shallow groundwater. Cadmium is listed in Appendix D, Table D-7 (of the draft EIR) as being relatively mobile in moderately acidic environments, along with Se and Mo.

The proposed GO provides for protection of these fairly uncommon hydro geologic environments by excluding such soil conditions from the GO (Mitigation Measure 4-1) and requiring additional preapplication testing and monitoring in cases where groundwater is within 25 feet of the land surface (see Appendix A).

26-22. This comment pertains to the potential environmental threat of mercury compounds and their various transformations when added to soils through biosolids applications.

Although mercury compounds were not specifically discussed in Chapter 3 of the draft EIR, the occurrence and behavior of many metal compounds in the soil environment, including mercury, are summarized in Tables D-6 and D-7 in Appendix D of the draft EIR.

Mercury compounds in biosolids are regulated under the Part 503 regulations and in the proposed GO. The Pre-Application Report (Appendix A) requires that the proposed biosolids and soils be characterized for mercury compounds. Also, the GO specifies that useable groundwater that occurs within 25 feet of the ground surface must be initially tested for mercury unless exempted by the Executive Officer. The Annual Reporting program also covers mercury and mercury compounds, including the requirement that the generator provide estimates of cumulative loading. These measures are considered to be adequate.

26-23. The commenter disagrees with the EIR's conclusion that until potentially significant health risks associated with SOCs in biosolids are identified, these compounds would likely not be (federally) regulated in biosolids. The commenter continues to note the complete difference in philosophy that the EPA uses to regulate pesticides, where the burden of proof is on the pesticide industry to prove safety. This is in contrast to biosolids, where the Part 503 regulations apparently must demonstrate potential health risks to scientifically support development of rules.

Several of the commenter's references support the view that SOCs present potentially significant health risks in cases where biosolids are incorporated in cropland soils. These references were reviewed and later incorporated as part of the final EIR. (See also Master Response 7 and Responses to Comments 28-10 and 28-17.)

There is a substantial difference in the way pesticides are used and applied to agricultural land, as opposed to biosolids. Several pesticide compounds are applied directly to crop foliage or fruit, some are systemic, and by definition nearly all are toxic to a least certain target organisms, if not more broadband in toxicity. This has led the EPA and most states to include additional safeguards and regulations limiting the types of crops to which some pesticides may be applied; wait periods prior to worker entry and harvesting; placing labeling information and other use restrictions; and in California, requiring that prescriptions regarding pesticide selection, application amounts and other use and application factors be developed by licensed advisers and applied by licensed applicators. Biosolids typically contain very small concentrations of SOCs and there is no evidence that these elements are causing a health risk. Nonetheless, EPA is currently considering modifying the Part 503 regulations to include some SOCs (primarily dioxin and furan compounds).

As noted by the title of the report by Cornell University in "The Case For Caution" (Cornell Waste Management Institute 1997), the current Part 503 regulations may not be as conservative as some people would like where uncertainty exists, as it does with metals and some SOCs in biosolids, but the draft EIR statement that federal (SOC) regulation will follow research and further risk identification is nevertheless true.

The EPA, several national laboratories and university research contractors are continuing to research SOCs in biosolids and the potential human and environmental health risks they pose. As conclusions and recommendations on SOCs (and metals and pathogens) and long-term impacts on land productivity and crop uptake are made, the EPA may need to revise the Part 503 regulations. Revisions to the Part 503 regulations will be reviewed and considered by the SWRCB as they relate to the proposed GO. However, the SWRCB has added a level of protection in these proposed GOs by requiring testing for SOCs of particular concern in biosolids, and in the case of grazing animals, delaying grazing entry. In cases where biosolids testing indicates elevated concentrations, the RWQCBs have the discretionary authority to request additional follow-up tests, or exclude the application from the proposed GO and consider it for an individual permit application warranting more detailed technical review.

26-24. It is acknowledged that there is ongoing work to characterize pathogens using genetic techniques. Clostridium spores have not been shown to be a significant hazard associated with biosolids management to date (U.S. Environmental Protection Agency 1989a, 1989b; U.S. Environmental Protection Agency 1992). The techniques employed in biosolids management in California and the practice of using Best Management Practices as recommended by the California Water Environment Association Manual (California Water

Environment Association 1998) protect against infection or contamination from these pathogens and pollutants. The presence of a potential pathogen alone does not make it a public health concern. There must be an exposure route and an adequate concentration to provide an infective dose. Aerosolized *Clostridia* has not been a suspected cause of disease via sewage sludge in the literature surveyed to date.

Polychlorinated biphenyls (PCBs) are a widespread environmental contaminant and are no longer being manufactured (draft EIR page E-41). Studies conducted by EPA in developing the Part 503 regulations indicated that PCBs were found in 19 percent of the sludge sampled in the National Sewage Sludge Survey and that those sludges with particularly high concentrations of PCBs may pose some dangers that the risk assessment would consider unacceptable (National Research Council 1996). The exposure assessment value of 4.6 mg/kg was used in the Part 503 risk assessment to set at an application rate of 10 metric tons/ha/yr. In California, biosolids have been found to have very low levels of PCB, with most samples consistently below detection limits for this complex matrix, which is in the range of 1-2.2 ppm. The proposed GO will require monitoring of biosolids for PCB levels.

With regard to pathogenic microbial species in aerosols and volatile mercury compounds in gases, no specific concerns were identified during the respiratory exposure pathway risk assessment conducted for the Part 503 regulations.

26-25. Areas where biosolids may be subject to washout conditions or gully erosion are prohibited. Also see Master Responses 13 and 17, and Response to Comment 21-80. Also, a lack of RWQCB quorum does not translate to an inability to provide oversight. However, in such cases, it does mean that some formal enforcement must be postponed on a temporary basis.

26-26. The analysis of groundwater impacts with respect to depth of groundwater is described in Master Response 15. Master Response 14 describes the analysis of groundwater impacts from regulated and non-regulated contaminants with respect to protective measures in the proposed GO designed to prevent contamination from nitrate. Master Responses 13 and 17 generally describe the basis for the analysis of potential surface water quality impacts under the proposed GO. Individual Responses to Comments 21-39, 21-41, 21-42, and 21-43 further address specific issues of the analysis of surface water quality impacts. SWRCB staff believes the evidence supports the EIR's conclusions that risk to surface water quality from biosolids application is sufficiently low, additional protective measures are included, and RWQCB staff have authority to require individual waste discharge requirements for any application project that they feel would not conform to provisions of the proposed GO.

26-27. The cited sentence included in the EIR was stated as a fact regarding the existing and anticipated regulations for cleanup and abatement requirements for hazardous wastes. The statement should not be construed to mean that biosolids would be applied under the proposed GO in a manner that would create hazardous waste conditions. It simply stated

the fact that if in the future, a hazardous waste cleanup order was enacted, biosolids landowners would be subject to those regulations. SWRCB staff does not believe its proposed action of regulating the land application of biosolids will lead to a later requirement for cleanup of contaminated soils or groundwater.

26-28. This comment refers to Mitigation Measure 4-1, which restricts crop choice to non-metal-sensitive crops where "moderate" soil limitations to biosolids occur. Specifically, the comment author asks how post-application cropping options will be limited to crops which are not metal-sensitive and yet have the ability to bioaccumulate dangerous levels of metals.

This mitigation measure is designed to preserve agricultural productivity of lands by precluding the growing of metal-sensitive crops, such as lettuce and spinach, on certain lands. By logical extension, if these sensitive crops were grown on the land prior to biosolids application, then the landowner would be alerted that there may exist a compatibility problem between the soils, biosolids, and normal crop rotation. The landowner then must decide if biosolids application is in his or her best interest, as future agriculture land uses could be restricted.

The commenter raises a valid point. This mitigation measure does not directly address the issue of bioaccumulation of metals in non-sensitive crops, such as tomatoes. This is primarily a public health issue, which is addressed in the derivation of the biosolids ceiling concentration limits and the cumulative loading limits in the Part 503 regulations. However, under the broadest definition of productivity, metals accumulation in the soil can potentially adversely affect land productivity by precluding the growing and marketing of certain crops (such as tomatoes) known to accumulate heavy metals. As noted in the draft EIR, the risk analysis completed by the EPA may not have considered all potential crop-soil condition combinations that occur in California.

To address potential issues associated with heavy metals that could be bioaccumulative in crops grown on agricultural lands with moderate limitations to biosolids, Mitigation Measure 4-1 is revised to prohibit known bioaccumulative crops, as follows:

> At sites having a "moderate" limitation, biosolids may be applied only where the crop is not known to be particularly sensitive to metals and nutrient imbalances, or is not known to be bioaccumulative of heavy metals.

As part of implementation of this mitigation measure, the applier is required to contact a UC Extension representative, a farm advisor, or similarly qualified individual regarding future restrictions on crops to be grown at the proposed land application site because of increased metals levels.

26-29. The commenter recommends correcting the draft EIR's language on page 4-7, which notes that some metals occur in soils in relatively low levels but that their effects are synergistic, making impacts additive.

The commenter is correct. The text in the last sentence, third paragraph on page 4-7 is revised as follows:

> ...., making impacts more than additive in some cases.

26-30. The commenter disagrees with two statements on page 4-9 and provides references to support the disagreement.

The first statement pertains to the assertion that biosolids have been applied to California soils in some areas for more than 20 years without apparent problems related to heavy metals. The second statement concerns the fact that the draft EIR indicates only about 10 to 15 percent of California soils have inherent conditions that would lead to heavy metals problems following biosolids applications. The commenter believes the percentage is actually higher and asks for technical justification for this estimate.

The commenter is correct. The first statement is an over-generalization and lacks supporting documentation. This section of the draft EIR pertains to impacts of heavy metals on land productivity, and the statement on page 4-9 is hereby revised as follows:

> However, biosolids have been land applied to California soils for over 20 years in some areas and no significant land productivity problems related to heavy metals have been documented.

This revision is intended to reflect the fact that some researchers have documented elevated levels of heavy metals in some soils and plant tissues from agricultural crops grown on biosolids-amended soils. The text modification, however, does not change the significance conclusions presented in the draft EIR.

The second statement is based on the National Soils Handbook (Soil Conservation Service 1983) limitation ratings for biosolids. This USDA rating system, based on the research and professional opinions of their staff scientists and experts, is used to evaluate a land area's suitability or limitations for biosolids applications, considering protection of farmland, environmental and public health issues.

As the rating system indicates, the USDA considers soils and sites to have severe limitations for biosolids applications only if they meet one of the following conditions: have low cation exchange capacity (5 or less milliequivalents per 100 grams), very acidic (pH 3.6 or less), underlain by seasonal high groundwater at shallow depths (less than 1.5 feet), strongly saline (electrical conductivity 8 deciSiemens or higher), and on sloping land

(greater than 15% slope). (Note that several other factors not relevant to these issues or to conditions typical of California soils are also included in the rating system.)

Based on knowledge of soil conditions in California, including a review of such references as the NRCS taxonomic classification (Classification of Soil Series of the United States, California), less than 10% of California's agricultural and rangeland soils with slopes of less than 20 percent and which would geographically qualify for consideration in the proposed GO, are either very acidic or have low cation exchange capacities. If the criteria for agricultural and rangeland soils with moderate limitations are included, the upper limit would still be less than 15% of California soils. In fact, few non-forest soils in California are moderately to strongly acidic (have pHs less than 6.0); very sandy soils with low cation exchange capacities, although widespread in some regions such as the east side of the San Joaquin Valley, or along the coast, are not common from a statewide perspective. Coastal zone soils are excluded from the proposed GO.

26-31. The commenter notes several research articles that indicate that soil micro-organism activity may be adversely affected by low levels of metals in soils to which biosolids have been added, and asks what scientific basis there is to the statement on page 4-10 of the draft EIR that many of the SOCs in biosolids would degrade over time.

As mentioned in the draft EIR, there is an extensive technology in hazardous materials remediation that relies on natural or enhanced bioremediation of organic compounds in soils. The EPA and the hazardous waste management bioremediation industry has several World Wide Web sites devoted to this issue, including extensive lists of organic compounds that are subject to bioremediation. Two of the oldest technologies for bioremediation of organic contaminants include furrowing and discing (land farming) to promote volatilization and photodegradation, and incorporation of manure, fertilizers, and irrigation to promote good populations of naturally occurring soil micro-organisms capable of breaking down the undesirable organic compounds. These are essentially the steps taken in incorporation of biosolids into agricultural soils.

26-32. The commenter disagrees with the statement on page 4-11 of the draft EIR, in that it appears unlikely that regulated heavy metals would accumulate in pastures or affect forage productivity or animal health. The commenter cited the risk of molybdenosis in pastures naturally high in Mo, which could be exacerbated from application of biosolids that might also be high in Mo. The commenter also points out a similar risk to pasture animals in San Joaquin Valley areas with naturally high selenium levels to which biosolids high in selenium might be added.

The draft EIR text indicated that if such above-described problems were to occur, they would likely be rare. This is a correct statement when viewed from the proposed GO's statewide perspective, but the potential problem could be more common when viewed from a countywide perspective, such as the case in Kern County. Please note that the Pre-Application Report requires that prior to land application, the application site soils be

tested for native levels of selenium, copper, and molybdenum, and other trace metals, and that unlike the Part 503 regulations, these native levels must be factored into the cumulative loading rate determination. This procedure will provide a good measure of protection against the sort of grazing problems that could develop in Kern County, particularly considering that many local farmers and ranchers are aware of the problem and would consider this issue in planning and decision making on biosolids land application projects in this area. Note also that Mitigation Measure 4-1 was revised in the Response to Comment 12-2 to further address this concern.

Also see Response to Comment 12-2.

26-33. The draft EIR's information on disease cases statewide has been modified and the incidence rates by county have been calculated and reported in a revised Appendix E of the draft EIR included in this final EIR as Appendix B, and in new Tables 5-6 a and b, 5-7 a and b, and 5-8 a and b. The information presented in the draft EIR on reported infectious disease incidence is included because it provides the only available public record of the occurrence of diseases that are commonly associated with public exposure to biosolids. As stated in the draft EIR, page 5-6, "If any association between biosolids use and illness exists, it may be evidenced as an increase...; therefore, existing data will not provide conclusive evidence of the degrees of such a relationship, but may nevertheless provide useful information." The information has been presented in the EIR in that spirit. It has not been asserted that these data provide statistical validity to a claim that biosolids is not responsible for an increase in illness.

26-34. The statement made is deleted from draft EIR page 5-9. ~~"Living things have evolved with these natural substances ("endocrine disruptors") and have mechanisms to metabolize or degrade them so they do not bioaccumulate."~~

Endocrine disruptors were discussed in more detail in Appendix E of the draft EIR, Part 3, which includes compounds which may be present in trace amounts in biosolids. Testing of many of these is required, including PCB Aroclors, aldrin/dieldrin and semi-volatile organics. As more information on endocrine disruptors is developed and regulatory programs are created to address any documented need for regulation, the proposed GO may be modified to account for environmental exposure that might be associated with biosolids. At present, no such evidence is available to indicate any potential risk to human health exists from the land application of biosolids that meet the minimum requirements specified in the proposed GO.

26-35. The proposed GO and Part 503 regulations require that biosolids be treated to provide for reduction of pathogens and vector attraction. Proper treatment prior to application and incorporation into the soil are management practices which should preclude significant insect attraction. Some insect attraction is likely.

26-36. *Cryptosporidium* infection is transmitted through animal-to-person contact or person-to-person contact, or through contact with fecally contaminated surfaces, as well as via ingestion of fecally contaminated food or water. Reports in the literature relate several sources of infection. For example, one report implicated an outside garden hose that had probably lain in fecally contaminated grass, and was subsequently used to fill drinking water coolers at a day camp (Regan et al. 1996). Outbreaks associated with fecally contaminated recreational waters (Bell et al. 1993; McAnulty et al. 1994), day care centers (e.g., Alpert et al. 1984; Anonymous 1984), and infected farm animals (e.g., Miron et al. 1991; Lengerich et al. 1993) have also been recorded in the past. Laboratory research animals have been implicated as sources of infection (e.g., Anderson et al. 1982), and some traveler's diarrhea is also likely attributable to *Cryptosporidium* (Ma et al. 1985; Soave and Ma 1985). While no transmission from household pets to humans has been proven, there are suspicions of such episodes (Juranek 1995).

Sewage/wastewater treatment decreases oocyst content, but oocysts remain in the treated effluent, suggesting that sewage discharge may be a significant source of oocysts in the environment (Rose 1990). Agricultural sources (runoff from dairies, grazing lands) may also be of as much concern as human-derived sewage effluent based on the level of oocysts present per liter of water as shown below:

Cryptosporidium oocysts in surface waters

Study	Probable source of contamination	
	agricultural runoff (dairy/ranch) (average no. oocysts/L)	human wastewater (treated) (average no. oocysts/L)
Madore et al. (1987)	2904	1864
Ongerth et al. (1987)	1.53	1.0*
Rose et al. (1988)	1.09	0.58

* possible agricultural impact as well. After Rose (1990).

Although contaminated food is considered a source of *Cryptosporidium*, there seem to be few documented incidents. One outbreak occurred among individuals who drank fresh-pressed apple cider at a county fair where the cider was pressed from orchard-collected apples, including some fruit from the ground, apparently contaminated with animal feces (Millard et al. 1994). Inadvertent fecal contamination of foodstuffs is implicated in many instances of foodborne illness and it is not unreasonable to surmise that infected foodhandlers are sources of *Cryptosporidium* infection contamination of beverages, salad greens or other uncooked foods. Cooked foods would be safe unless re-contaminated, because the oocysts are heat-sensitive. Juranek (1995) observes that about 50% of dairy calves shed oocysts, and the parasite is present more than 90% of dairy farms. This raises the possibility that ingestion of unpasteurized milk could lead to cryptosporidiosis.

Given what is known about transmission and the wide variety of sources, it is not possible to rank the various sources and transmission routes in terms of relative importance to human disease, but certain behavioral patterns can reduce the chance of exposure and hence infection. The importance of educating and counseling high risk groups such as AIDS patients is well recognized (Juranek 1995; Juranek et al. 1995). Suggestions include options such as boiling of drinking water, installation of point-of-use water filters (and information on suitable/nonsuitable types), bottled water (and cautionary information with respect to labeling, etc.). Other high risk (but immunocompetent) groups include child care workers, diaper-age children attending child care centers, persons exposed to human feces by sexual contact, and care givers who might directly contact contaminated feces during their course of duty. The same can be said of those who are involved in wastewater and biosolids management where safe work practices and proper sanitation and personal hygiene combined with use of protective equipment are of key importance to prevent illness due to accidental exposure to contaminated liquids or solids.

The proposed GO limits the risk of human infection with cryptosporidium by the level of treatment needed to meet Class A and B requirements and the management practices that are required. There is no evidence that land application of biosolids has led to cryptosporidium infection of humans.

Also see Response to Comment 26-38 and Master Response 8.

Regarding the study included in Strauch 1991, the report also notes that there was mixing of sewage sludge with manure from pigs and cattle in tanks prior to application. The study was conducted Switzerland; the sludge was generally applied to land in winter for growing hay with a short interval between time of application and mowing. The information does not appear to be applicable to California biosolids management practices (e.g. non-liquid application, much warmer climate) and is not supported with enough documentation to determine if indeed the source of the salmonella was municipal sewage sludges.

This same paper cited that healthy cattle may excrete up to 10 billion salmonellae per gram of feces and that excretion at such a level by only a few animals in a herd could render manure a potent source of pathogenic organisms (page 817 in Strauch 1991).

26-37. This information is noted. *E. coli* is the indicator for all pathogens for Class B biosolids with the requirement that the geometric mean of seven samples be less than 2 million MPNs per gram of total solids at the time of use. E Coli O157:H7 has been most often associated with undercooked beef. The first case reported in California occurred in 1992 in San Diego County (see revised Table E-1a) with the number of reported cases increasing from the single case in 1992 to a total of 264 in 1998 largely as a result of better diagnostic techniques and awareness. Incidence rates are still quite low, ranging from 0-10.8 cases per 100,000 persons. The highest reported incidence rates were 10.8 cases per 100,000 in Inyo County in 1994 and 9.5 per 100,000 in Tuolumne County in 1998 (Table E-1b). This emerging pathogen is of concern and warrants measures to ensure that proper management

of food preparation occurs. The proposed GO controls the risk of *E. coli*-related health issues by the required combination of treatment methods and management practices.

26-38 The commenter states, "The 1993 Cryptosporidium outbreak in Milwaukee was the result of a waterborne pathogen. This disease is so serious that Los Angeles Metropolitan Water District has spent $3.3 million on a Cryptosporidium Action Plan, as of 1997. To date there is no commercially feasible domestic water treatment for Cryptosporidium. MWD News Release, 1997."

Comment noted. This is a national problem of concern and is being addressed by water purveyors. As reported in Appendix E (page E-12) of the draft EIR and provided in the final EIR in Appendix B, little is known about the viability of oocysts of this protozoan after biosolids treatment to meet the pathogen reduction requirements of the Part 503 regulations. Since *Cryptosporidium* is hosted by over 40 mammals, it is found in many locations. It has not been reported in association with biosolids land application practices (page E-13). Recent research by Garcia et. al.1999 has shown that the level of Cryptosporidium oocysts in Californians is an order of magnitude lower than the national average which corresponded with the low number of oocysts detected in raw sewage. The data to date suggest that oocyst presence is not a primary public health issue for the wastewater treatment industry in southern California, and that reclaimed wastewater in particular posed less risk than many surface water supplies because of the high level of treatment and low level of oocysts present after treatment.

26-39. Information presented in these papers is known and was addressed in Chapter 5 and Appendix E of the draft EIR. Strauch's paper deals with his review of the literature and European (particularly Germany) experiences with agricultural utilization of sewage sludge. Conditions in Europe are different from those in the United States and California. Generally it is colder, wetter, and there are more intensive uses of land in close proximity to agricultural areas. Conditions are much more conducive to survival of pathogens for longer periods.

The concerns raised in the quotations provided have been addressed by the NRC in its evaluation (National Research Council 1996). Its report on the use of sludge in food crop production concluded the following (page 172):

> From a regulatory perspective it is important to remember that the Part 503 Sludge Rule and state regulations governing the agricultural use of reclaimed wastewater merely augment a wide array of existing institutional programs and controls that have responsibly mitigated risks for these practices in the past. Related regulations pertain to toxic waste handling and treatment, surface and groundwater protection, and public health. These regulations and their overlapping authority are complex and need to be adequately explained to both the regulatory community and the interested public to avoid confusion and the perception that beneficial use is a disguise for the dumping of wastes.

> Although some clarification and streamlining of the Part 503 Sludge Rule would be beneficial, the regulatory framework appears generally adequate to manage risks associated with land application of both treated municipal wastewater and treated sewage sludge.

Others opposed to land application of biosolids have cited studies which they claim have documented *salmonella* infection of cattle grazing on pastures fertilized with toxic sewage sludge and a cycle of infection from humans to sludge to animals to humans. Works cited included Taylor and Burrows, 1971; WHO, 1981; and Dorn, 1985 (National Alliance Against Sludge). Again, most of the papers cited related to use of slurries of animal wastes combined with human wastes with the degree of treatment being questionable. Also, such instances occurred in colder climates than California, where bacteria can live longer outside their hosts if not killed during treatment processes.

26-40. The commenter states, "Anaerobic digestion is not necessarily effective at reducing bacterial hazards. See research by Strauch, Scampi and Suslow as previously presented. EPA allows 2 million *E. coli* bacteria per dried gram of Class B sludge. This is not a small number. Testing for other pathogens is not required. A single bacterial analysis is not necessarily representative of the presence of other pathogens."

This issue has been thoroughly researched by EPA. Its regulatory approach to treatment and management of sewage sludge has provided for a framework that is sufficient to protect public health. Also see Response to Comment 26-39.

26-41. See Master Response 18.

26-42. Refer to draft EIR pages 5-27 and 5-29

The county employees contacted were those in the environmental health units of the counties with general responsibility for overseeing biosolids management operations or local permitting. It was felt that these employees would have the best first-hand knowledge of biosolids operations and any associated public health or environmental health-related impacts or problems. They are not trained medical officers or epidemiologists, but they are capable of reporting the findings of such personnel where public health problems have been reported.

26-43. Appendix E of the draft EIR and Appendix B of this final EIR, in the discussion of Fungal Diseases (draft EIR page E-25), noted that *Aspergillus fumigatus* concentrations could be 10 times higher than background levels at active commercial composting facilities. Further discussions on pages E-26 and E-27 describe the risks and design and personal protection precautions needed to minimize health risks to workers. Appendix E of the draft EIR has been revised and is included in this final EIR in Appendix B.

Also see Response to Comment 15-2.

26-44. Based on the evaluation in the draft EIR and the proposed GO's setback requirements, application of biosolids within the confines of the GO would not threaten wildlife and fisheries. Mitigation Measures 7-1 and 7-2 were designed to prevent adverse effects to special-status plant and wildlife species and biologically unique or sensitive natural communities. Additionally, the proposed GO requires, a notice of intent to be sent to the Department of Fish and Game for each application submitted to the RWQCB. There is no evidence that the biosolids land application activities of the past 20 years have adversely affected the state's fish and wildlife populations.